

TINKLE presents

vol. 01 issue #01 01/08/2010

BRAINWAVE

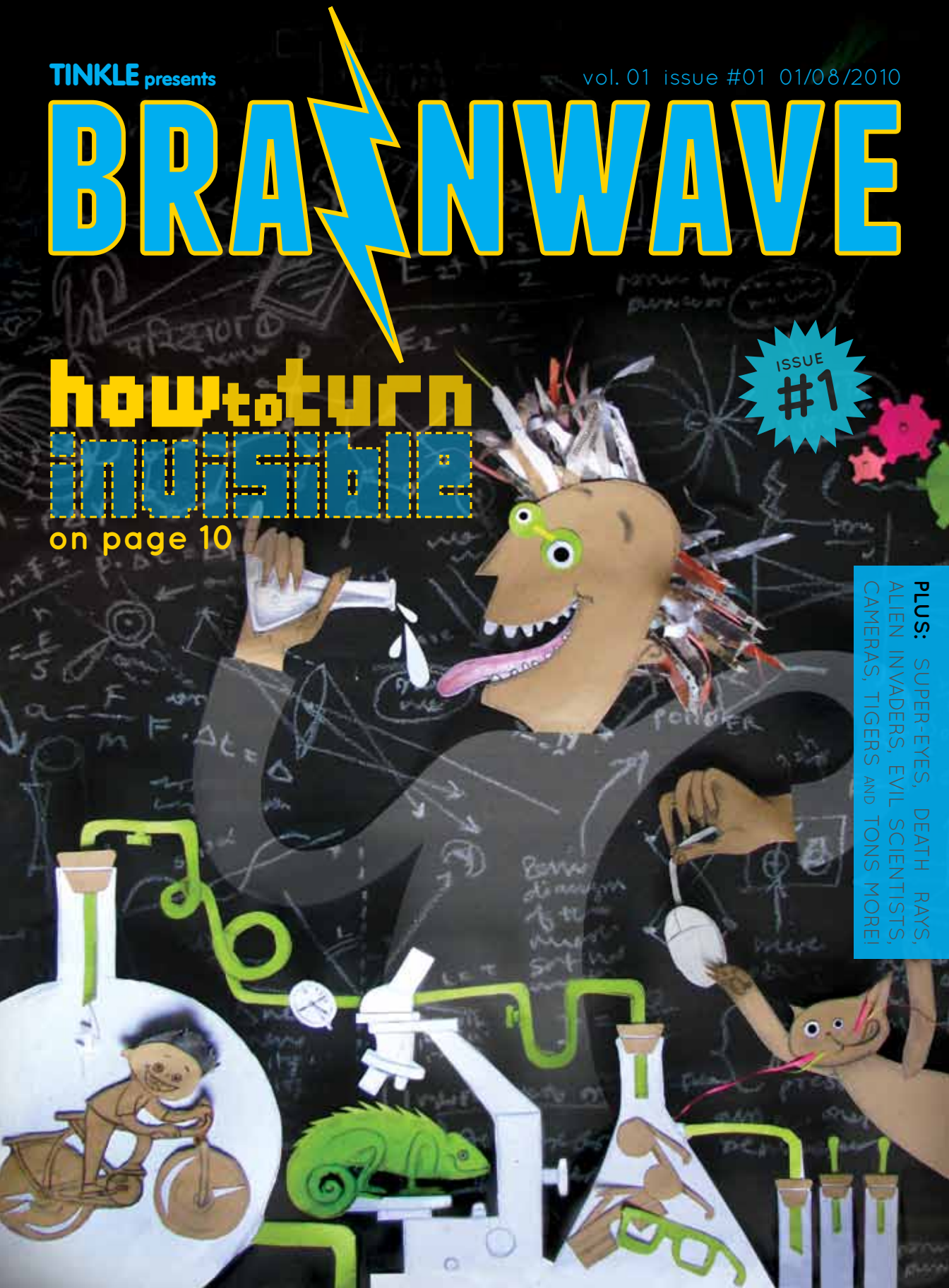
how to turn
invisible

on page 10

ISSUE

#1

PLUS: SUPER-EYES, DEATH RAYS,
ALIEN INVADERS, EVIL SCIENTISTS,
CAMERAS, TIGERS AND TONS MORE!



WIP



artwork: Sameer Kulavoor

BRAINWAVE

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FIRST LIGHT

Imagine yourself on a new moon night about a million years ago. You're sitting in a jungle with animals all around. It is so dark that you can't even see your own hand! A storm cloud rolls in. In the flash of lightning that follows, you see your surroundings lit up for just a fraction of a second. And then it goes dark again. It's as if you're in an endless power cut, with no handy flashlights to switch on!

In the old days, the only source of light was natural light – light that came from the sun, the moon, or the odd lightning bolt. The first big break with light happened when mankind learned how to make its own fire and used it to see in the dark. The second big break came in the 1800s, when scientists created light using electricity. Here we tell you the bewitching story of light's journey from big break No.1 to big break No. 2.

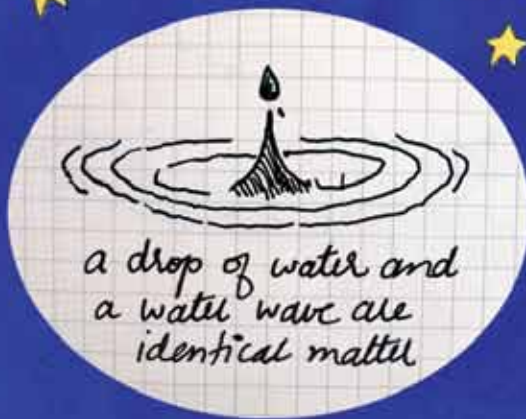


The story of Light

IS LIGHT LIKE WAVES OR BLIPS?

The story takes off in the year 1675 when Isaac Newton (yes, the same guy who had the apple fall on his head), discovered something fantastic about light by looking at his own shadow. Have you noticed that when you stand against the sun, your shadow has sharp edges? Newton felt that such shadows were the result of light particles being blocked. This told him that light was made of solid particles. If this sounds a bit baffling, think of light as being made up of millions of microscopic crumbs or tiny blips. According to Newton, the edges of your shadow are sharp, because particles of sunlight travel in a straight line.

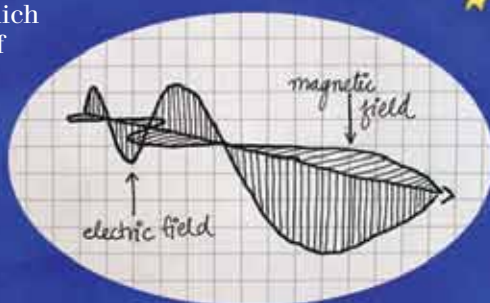
Ah, but the story of light is not as simple as all that! There was a twist in the tale, sometime in the 1800s, when British scientist Thomas Young saw light in a way that was very different from how Newton viewed it. Young's experiments revealed that light travels like waves. It could move past edges, and make patterns similar to water waves. It could bend around objects, spread out and merge. (Think of ripples in a pond when you throw in a stone). He concluded that light was not a particle, but a wave.



ABOUT LIGHT WAVES

But if light was really a wave, as Young proposed, what was it made of? This missing piece in the deepening mystery was discovered by Scottish scientist James Clark Maxwell. In 1864, Maxwell realised that light was an 'electromagnetic wave'. His experiments showed that when electrically charged particles move around quickly or vibrate, they also cause the electric and magnetic fields around them to change and vibrate. This results in the creation of electromagnetic (EM) waves.

Some of these waves – but not all – are detected and perceived by the human eye as light. A-ha! Did you get that? The light which we see is actually a kind of electromagnetic wave.



THE LIGHT AT THE END

Many more discoveries have been made about light and its nature over the centuries. If you'd like to know more, head to the YouTube links we have listed or ask your physics teacher for an update on the latest happenings in the world of light.

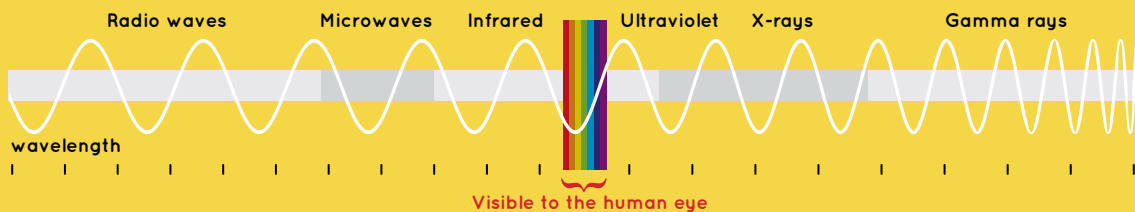
Light (minus the boring bits!)

For answers to grave questions like how laser beams can sizzle human flesh and what stops our eyeballs from falling out, pick up Nick Arnold's *Horrible Science* book, 'Frightening Light'. And search YouTube for these fun show and tell lessons on light: Adventures in Science: 'Science Of Light' Bill Nye the Science Guy: 'Light and Colour' How Light Enters the Eye

VISIBLE AND INVISIBLE LIGHT

If light is an electromagnetic wave, then can we shake a magnet or an electrical wire and make it give out light? If only it were as easy as that. The electromagnetic waves of visible light vibrate at an amazing million million times per second. The number of vibrations per second is called 'frequency', and the unit of one vibration per second is 'hertz'. The frequency of visible light is between 450 and 750 million million times per second, or 450-750 trillion hertz!

Are there EM waves or light that are invisible to human beings? Sure there are. Your dish antenna – that is your eye in the sky – detects or "sees" electromagnetic waves with a frequency of about 100 million hertz. You cannot see it, but your dish antenna can.



What we just talked about is called a spectrum – visible light has a spectrum from red to violet as was found by Newton by splitting sunlight using a prism. But there are invisible electromagnetic waves belonging to other parts of the spectrum. Gamma rays, X-rays, UV rays, microwaves, radio signals, infrared and WIFI are all EM waves belonging to different parts of the spectrum.

the WHITE SPINNER

Disc made of thick white card, divided into 7 parts and filled in with the colours of the rainbow

Plastic glass with a hole punched into its bottom

Pencil

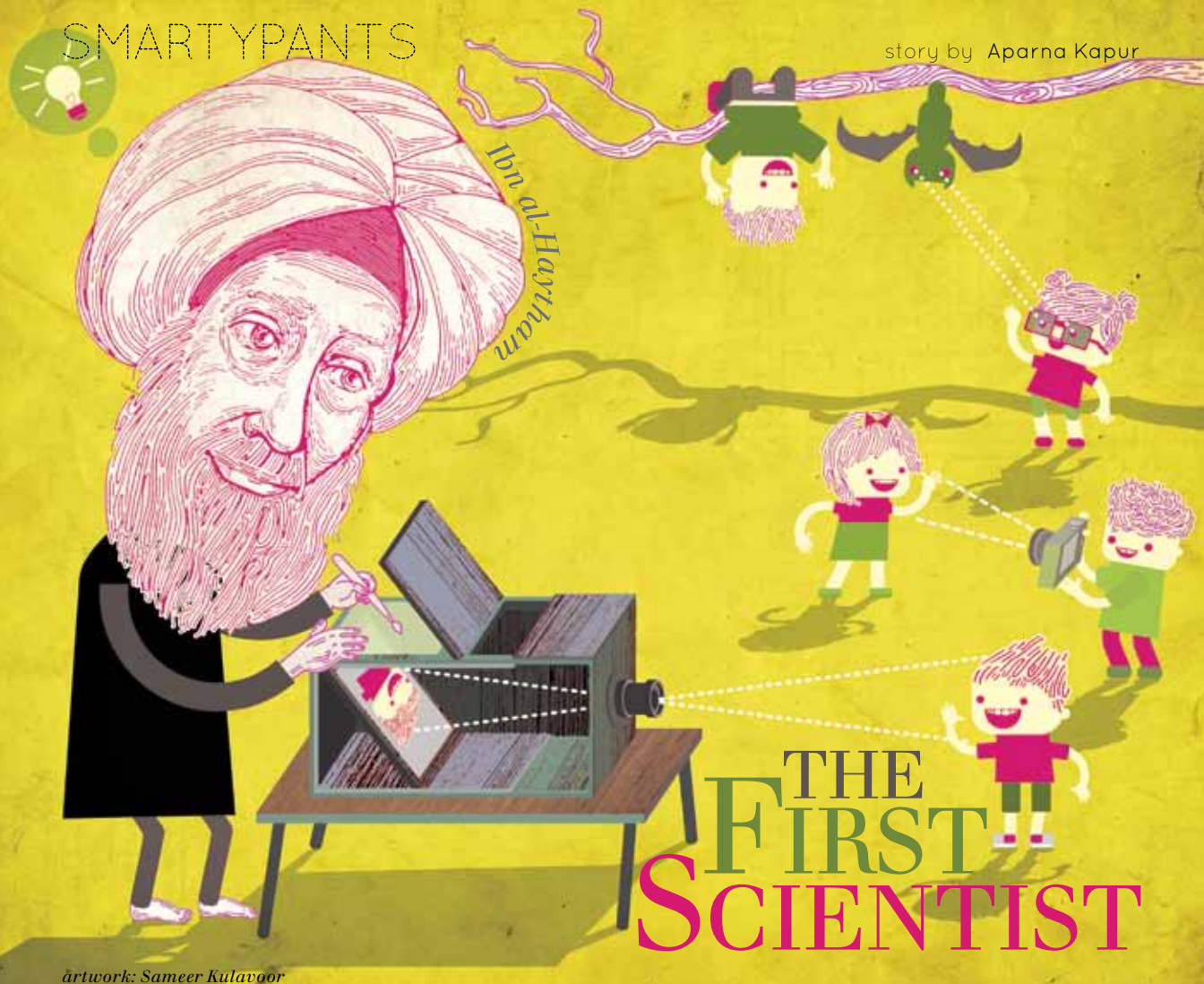
Fit the pencil into the disc and stand it in the glass like so

As the pencil slows down, you'll see this pattern

SPIN the pencil to see the colours blend with one another and into a greyish white

There's no such thing as a perfect technology. Can you improve on this toy design? Do you have a better idea for a spinner? You do? Write/draw out your designs and mail them to us at brainwave@ack-media.com!

AD



artwork: Sameer Kulavoor

Can you believe that until the 1500s, everyone thought that the Earth was flat? Until, that is, Magellan led the first expedition that actually circled the earth and proved that theory wrong. People in the past based their theories on explanations that sounded grand or polished. No one spent time observing, experimenting or proving.

The question of “how we see” also lacked a scientific basis. Until the 10th century, there were two schools of thought regarding this perplexing matter. One bunch of people believed that we saw the world around us because our eyes emitted rays of light that fell on objects and made them visible. Another set of people believed Aristotle’s claim that we could see because physical forms from objects actually entered our eyes. But both

these theories were just calculated guesses.

In the 10th century, an Arab scientist called Ibn al-Haytham (known to the West as ‘Alhazen’) brought to these questions (and hence, to science in general) the spirit of scientific inquiry. He conducted experiments, made observations and drew conclusions.

He proposed that light exists irrespective of whether our eyes are closed or not. He proved this by conducting an experiment in which he hung two lamps outside a room, lighting up two spots on the wall. When one lantern was covered, the spot was darkened. This showed that light existed independent of the human act of seeing it. He further explained that when our eyes open, rays of light enter, helping us see objects around us.

Al-Haytham went on to write the *Book of Optics*, where he made startlingly accurate descriptions regarding the functioning of the human eye. He is rightly referred to as the ‘Father of Modern Optics’. Apart from his major discoveries in optics, al-Haytham also made notable observations on the physics of light. Several hundred years before Newton explained it to the western world, al-Haytham had already arrived at the notions that light travels in a straight line and is composed of

particles. He studied refraction, and opened wide avenues for research in the area of visual perception and optical illusion.

Al-Haytham was the first person to recognise the importance and responsibility of being a scientist. He gave birth to ‘the scientific method’, the process of deducing facts from existing ones, constructing a hypothesis and testing it in controlled conditions. This is why al-Haytham is known to the world as the first scientist.

When Alhazen started out as a professional engineer, he was a bit cocky about his mathematical abilities. He once claimed that he could regulate the flow of the River Nile. Hearing this claim, Egyptian ruler Al-Hakim Allah summoned him to Cairo to undertake this feat. However, when he got down to planning it, he realised the impossible nature of the task. Fearing the death punishment that Al-Hakim would award him, Alhazen faked insanity and was put under house arrest until the death of the ruler. Alhazen spent all this time wisely on scientific study and experimentation.

The Camera Obscura

4th century B.C.E.

A partial solar eclipse was taking place. The great Greek thinker Aristotle, probably out for a walk, noticed the image of the eclipsed sun on the ground through the leaves of a palm tree. Later, he noticed the same crescent shape forming through the holes in a sieve. In the time that followed, several others, including the Greek mathematicians Euclid and Theon, and the Arab Iraqi scientist Al-Kindi, made similar observations.

10th century C.E.

Another partial solar eclipse. The great Arab scientist Ibn al-Haytham who was lounging indoors, probably tired from a walk, noticed a bright crescent shape on a wall. This seemed odd, because the room had no windows. He looked again, more carefully, and noticed that the window shutter opposite the wall had a tiny hole in it. The light from outside

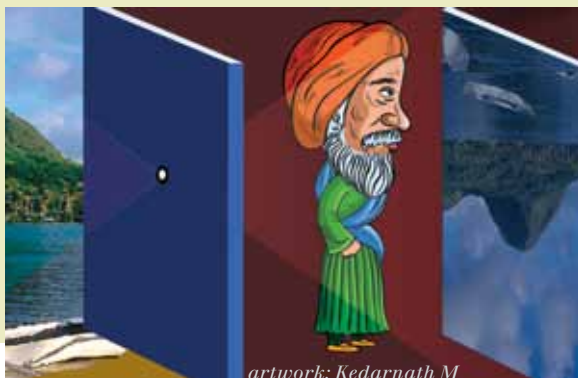
was passing through the hole and throwing an inverted image on the wall.

He connected this process with the way the human eye worked. He worked out, correctly, that people were able to see things because images were being projected into their eyes the same way the crescent image had formed on his wall.

Al-Haytham then decided to construct a replica of his image-forming room. If an image was produced in the same conditions as before, it would prove his theories on capturing light. The experiment was a success, and the ‘camera obscura’ was born.



The word ‘camera’ comes from ‘kamara’, the Ancient Greek word for ‘room’, and ‘obscura’ is the Latin word for ‘dark’. The most basic form of a camera obscura consists of a room or a box with a tiny opening on one side. Light from outside enters through this opening, producing an exact but upside down image of whatever is outside. These principles were later employed to develop cameras, making the camera obscura a pioneering discovery.



THE EVOLUTION OF CAMERAS

The first photograph, *View from the Window at Le Gras* and (below right) *Tartan Ribbon*, the first colour photograph



1826

The first photograph, 'View from the Window at Le Gras', is clicked by Joseph Nicéphore. The exposure time for the photograph is 8 hours, so the sun appears to be shining from more than one position on the photograph.

1837

Nicéphore and Louis Daguerre create the Daguerreotype process for developing photographs. The photographs are so clear that their viewers fear that the tiny people in the photograph can see them back.

1850

The Bellows Camera is invented. The bellows allows adjustment of the lens and is the first form of a 'zoom'.

1860

James Clerk Maxwell, who will publish his discovery of

electromagnetic fields later that decade, clicks the first colour photograph.

1865

John Trail Taylor invents flash powder. This is the earliest example of a flash. Later, flash bulbs will be used because Taylor's powder is found to be extremely unsafe.

1881

Thomas Bolas invents a detective camera for the British Police. These cameras are launched with appealing names like 'Demon Detective Camera', 'Tick-a' (a camera hidden inside a watch) and 'Photo-binocular'.

1888

George Eastman invents the first Kodak camera with a built-in film. He names his company Kodak because the name is similar to the sound of a camera shutter.

1893

Louis Boutan develops the first underwater camera.

1936

'Exakta', the first 35mm single lens reflex (or SLR) camera is launched.

1947

Edwin Land launches the first instant camera, the 'Polaroid Land Camera'. He was inspired to invent it when his three-year-old daughter asked him, "Why do I have to wait to see my picture?"

1977

Konica launches 'C35 AF', the first commercial autofocus camera.

1981

Sony Mavica, the first commercial electronic camera, is launched. The Mavica is known today as the "pioneer of the digital era."

1986

Fujifilm introduces the first commercially available, durable disposable camera.

1990

The first commercially available digital camera, 'Logitech Fotoman', is released. It records images in black and white and shoots in a resolution of one-tenth of a megapixel. It costs over \$25,000.

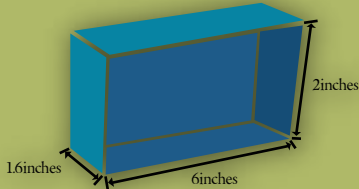
2000

Japan's Sharp Corporation launches 'J-SHO4', the first mobile phone with a built-in camera and colour display.

THE FANTABULOUS PIN-HOLE CAMERA

YOU WILL NEED:

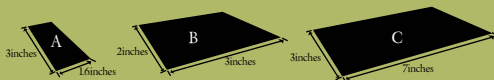
- 1) A box that's roughly this size: 1.6x6x2 inches



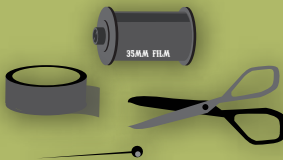
- 2) An old sketchpen



- 3) Few bits of black card paper including pieces of these sizes

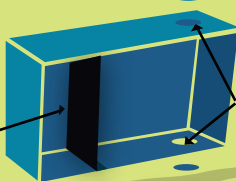


- 4) 35mm film roll
- 5) Sticking Tape
- 6) Scissors
- 7) Pin
- 8) Cotton



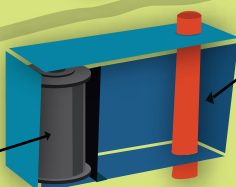
BUILDING INSTRUCTIONS:

Fold and paste the thin strip of black card (A) to make the film roll holder

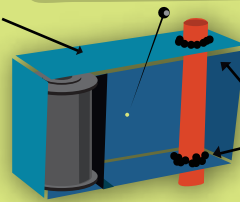


Cut off the ends of the sketchpen and insert it into the holes so it sticks out from both ends

The film roll can now fit in this box

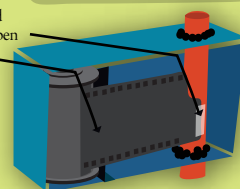


Poke a hole with the pin into the centre of the box

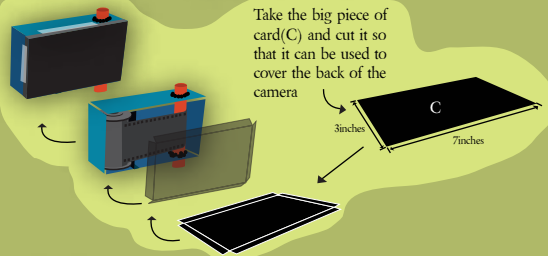


Stick cotton around the holes to block off any light that might seep in from here. Blacken the cotton with ink

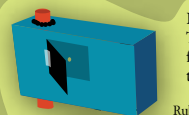
Pull out the film and stick it to the sketchpen with tape



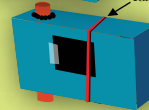
Take the big piece of card (C) and cut it so that it can be used to cover the back of the camera



Paste the third piece of card (B) over the pinhole. Tape only one side of it down, so you can open the flap whenever you need to shoot. Use a rubberband to hold the flap in place when not in use



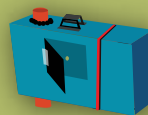
Rubberband



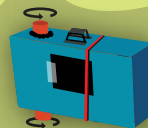
Viewfinder



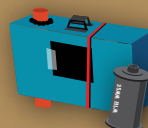
HOW TO USE IT:



Take a picture by lifting up the flap and then closing it again as quickly as you can! It's as simple as that!



Before you take the next pic, turn the sketchpen counter-clockwise (one full rotation only) to wind the film. To make it simple, make reference marks on the pen and the box like so



To get the film developed, give the camera to a photo developing studio, and let them extract the film themselves. They will do this in a dark room to prevent it from being over exposed

HOW TO TURN INVISIBLE

Just shut your eyes for a moment and let yourself travel into the future. The year is 2050. This fast-forwarded world is a technological wonderland with flying cars, frequent space travel and robotic butlers. But what is really strange about this strange new world is that human beings now possess the one superpower they have always pined for. Invisibility!

Life in this invisible world is much simpler and quite adventurous too. For one thing, law enforcement isn't such a pain. Robbers are regularly busted by policemen in invisible gear. Kids don't get into much trouble with the power to vanish their way out of any embarrassing situation. Wars are not fought with nuclear weapons but with invisible ammunition.



artwork: Vinayak Varma

But hold your imagination right there! If you think this is a regular sci-fi story featuring witches and Marvel superheroes, you're *so* wrong. *Invisibility is no longer just a fantasy!*

The science of the unseen

As we speak, scientists in different parts of the world are working to create ingenious technology that will let us disappear at will.

In fact, Professor Susumi Tachi, from the University of Tokyo, has already designed a crude invisibility cloak. A shiny raincoat (made of a special material called retro-reflectum) acts like a sort of movie screen. A computer projects scenery from behind the raincoat onto its front. So a viewer can see what's behind the raincoat, making the wearer invisible.

Now, for a second, imagine that you're wearing Prof Tachi's raincoat. And say there's a car parked behind you. The computer projects the picture of this car is onto you. Someone standing in front of you wouldn't see a boy or girl or any human form. Instead they would see a car. Putting on the raincoat creates the illusion that you're see-through!

Excited? You should be! Come, let's find out about some more awesome invisibility technology.

Technology to un-see

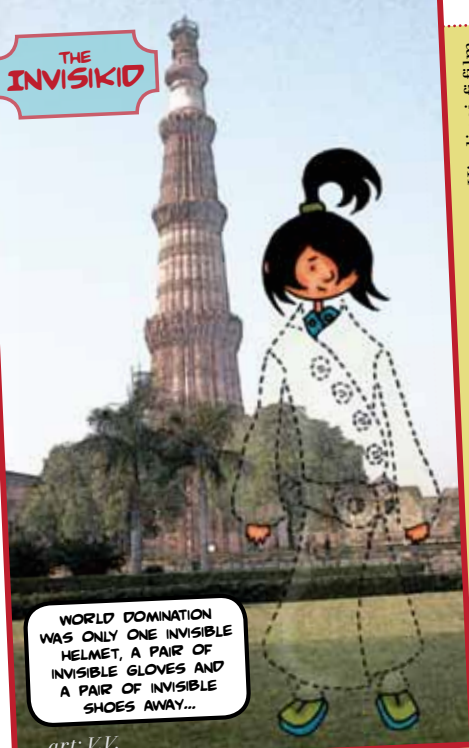
You see an object when light bounces off it and into your eye. But did you know that we

Vision is the art
of seeing what is
INVISIBLE to others.

- Jonathan Swift



photo: Luca Venturi



art: VV

In 1987, Anil Kapoor, Sridevi and Amrish Puri starred in a Hindi sci-fi film called *Mr. India*. The film is about a poor violinist who becomes a superhero, a group of madcap orphan kids, a dastardly supervillain named Mogambo and — the best part of the movie! — an amazing watch. What's so special about this watch? When worn and activated, it makes its wearer invisible! *Mr. India* is still a cult favourite among people who grew up in the 80s. Find a DVD of it and watch it, for a fun retro Bollywood look at invisibility!



can step in and play clever tricks with light such that we don't see things? The funda of invisibility is pretty straightforward — the cleverer you are at playing with light's behaviour, the better you can be at making people and things disappear.

Let's get to the bottom of this mystery with a real-life example of invisibility — soldiers dressed in camouflage. To keep themselves hidden to the enemy's eye, soldiers dress in clothes covered with green and brown splotches to look like the trees, leaves and rocks around them. As the light that bounces off the soldier's clothes is the same as the light that bounces off the jungle (green and brown), it's hard for you to tell them apart. And the soldier becomes — presto! — invisible!

But regular camouflage has one big drawback: the setting that you camouflage yourself against does not move along with you. So when the soldier dressed in his green and brown *jungle* outfit moves out of the forest and onto a concrete highway, he will

Overheard online:

for a cheap laugh when walking through town, it's always funny to bump into someone in a *CAMOUFLAGE JACKET* and say: "Sorry, didn't see you there!"

COVER STORY: INVISIBILITY

be as 'invisible' as a Christmas tree in the Gobi Desert! To overcome this limitation, scientists have come up with new and improved 'active camouflage' technology.

Real invisibility

The mechanism for active camouflage, works by making sure that no light whatsoever bounces back into your eyes. To make this happen, there is one special ingredient that needs to be added in — 'metamaterials'. Scientists are now focusing their attention on this special material made of tiny, tiny structures, the size of atoms. Metamaterials will enable us to take light and bend it around any shape and in any path that we'd like! This kind of technology will then enable us to create futuristic applications like invisibility cloaks. For real.

Metamaterials

Picture a cloak made of metamaterials. Such a garment could actually fool you into not noticing the person wearing it. Due to its unique physical composition, a metamaterials cloak will make sure that no light bounces off its surface to reach your eyes, making the wearer totally invisible.

Not surprisingly, armies and defence companies have become very interested in this exciting technology. Imagine what a metamaterials cloak, draped over a parked tank could do: it would be completely invisible to an enemy tank trying to shoot at it. While metamaterial invisibility cloaks are still very much the stuff of the future, that future isn't as far away as you might think.

IF we truly had the power to turn invisible, would there be a flipside? Think of a world where people could pull on their invisibility jackets and vanish at will. Crime and war might get a whole lot deadlier. Just think how difficult communication would be, if we could disappear mid-conversation, just because we happened to disagree! And wouldn't it get pretty chaotic if we could all keep changing things stealthily, under the cloak of invisibility?

What do you think an invisible world would be like? Would it be better, worse, more fun or quite dangerous? Send your thoughts to brainwave@ack-media.com!

Sultans of camouflage

Presenting the most devious animals in the natural world, which go to remarkable lengths not to be seen

A brown lizard scampering on a rock. A green caterpillar perched on a leaf. A polar bear lumbering through the snow. These animals can be pretty impossible to spot, thanks to their ingenious camouflage. Camouflage, or the ability to merge into the surroundings, is a technique that many animals use to keep themselves hidden from their predators or prey.

The most obvious example of camouflage in the natural world is seen in a type of lizard known as the chameleon. Some ingenious species of chameleon can change the colour of their skins to match the surface they happen to be on. This is why we refer to people who constantly change their behaviour to suit the occasion as being 'chameleons'.

But there is a host of other animals that use camouflage in more interesting and downright odd ways. The potoo bird, found in South and Central America, is pretty remarkable in this regard. Foraging for insects to feed on at night and sitting around on a branch by day, the potoo has a colour scheme and plumage pattern that match its tree dwelling. When the potoo becomes aware of any threat coming close, it shuts its eyes and makes its body rigid (*opposite page, top*). The effect of this behaviour is that the potoo starts to resemble a broken tree branch very closely.

Camouflagers are not just restricted to land, but abound in the sea as well. The flounder is one such aquatic creature that uses camouflage to great advantage. Found in the Atlantic and Pacific oceans, this fish changes its colour and texture to match the background it is moving against. So if the flounder is passing through a sandy ocean floor, it mimics the look of sand (*opposite page, bottom*). If it finds itself swimming

across a bed of coloured pebbles, it changes its appearance to complement the pebbles. Scientists have even placed the flounder in unfamiliar surroundings and found that it does a pretty good job of imitating these as well. When placed against a checkered board, for example, it not only produces alternate light and dark patches, but it also does so in a way that continues the pattern. Incidentally, scientists who are trying to make an invisibility cloak are attempting to use the flounder's camouflage technique!

Human beings play the game of camouflage too. In fact, it is a crucial tactic used by the military to conceal soldiers from the enemy by merging them with their surroundings through specially designed clothing. We are not just clever disguisers, but have also turned camouflage into something of an art. Sometimes, people camouflage themselves just for fun or even to make an artistic statement!

Military camouflage has one of its early roots in India. Back in colonial times, the East India Company's forces would roam about in their easy-to-spot white tunics, presenting big bright targets for native attackers. In order to blend into the landscape more effectively, the army dyed its uniforms a light brown shade that they called 'khaki' (after the Urdu word for 'dusty'). Today, military camouflage has evolved to a science. There are different patterns suited to the terrain and habitat of different countries, with really cool names like 'French Lizard' and 'Army Tigerstripe'. Go see a comprehensive list of military camouflage patterns at http://en.wikipedia.org/wiki/list_of_camouflage_patterns

Design your most ingenious camouflage outfit. Next, stand against the background you would like to merge into, look invisible, and click a picture! Get as devious as you can! Email your photos to brainwave@ack-media.com

potoo photo: The Lilac Breasted Roller @ Flickr
flounder photo: Moondigger @ Flickr
lithops photo: Yellowcloud @ Flickr



Peek-a-boo plants

It's not just animals that are stealthy camouflagers. Plants are well-versed in the art of making themselves hidden too. For instance, 'lithops', also called 'living stones' or 'pebble plants' are brilliant mimics (*see above photo*). These South African plants have a clever strategy to avoid being eaten by predators. Cunning lithops look exactly like the stones which surround them. They blend into their stony habitats so well, that they are all but invisible to the eye!



INVADERS VS. INVISIBLES



artwork: Sunando Chakraborty

DEAR HIGH COMMANDER GAAARH-LAK,

A major threat to our Earth-invasion plan is this disturbing new report of Earthlings who can turn invisible (file pictures included of subjects Susan S. Richards, Harry J. Potter and Griffin G. Griffin). I believe they turn invisible by controlling the ‘refractive index’ of their bodies.

So how do we defeat them if we can’t see them? To answer that, we must first understand exactly how these powers work.

Light changes angles and moves at different speeds through different materials. This is called ‘refraction’. Consider a coin in the open, under glass and through water:



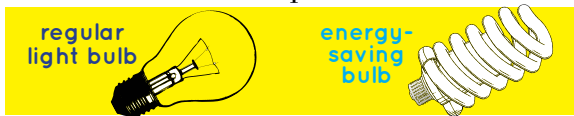
The amount that each material (the air, the glass, the water) changes the way the coin looks is known as its ‘refractive index’.

But two materials with a similar refractive index (such as oxygen and carbon dioxide) will allow light through without changing its speed or angle (that’s why both look the same to our eyes). That’s how these Earth-invisibles work: by controlling their refractive index, so that they match themselves to the air around them and disappear from sight.

BUT! Being invisible would also make you *blind*. You see, High Commander, to be able to see stuff, light has to hit the back of your eye. If you’ve gone invisible, light would pass right *through* your head, making you blind.

These super-powered Earthlings seem to be able to see properly even when they’re invisible. How? By seeing more kinds of light than what average Earthlings can see, that’s how! While *visible light* passes right through their eyes, *light of another wavelength* – the light we can’t see – must be hitting the backs of their eyes and allowing their retinas to perceive an image. Another wavelength such as infra-red, perhaps? Indeed!

Since they see in infra-red, regular, incandescent lightbulbs will seem incredibly bright to these invisibles. That’s because incandescent bulbs give off light in many wavelengths (in fact, only about 10% of its radiation is made of visible light). Fluorescent bulbs, on the other hand, won’t show up in their infra-red vision at all, because that’s how energy-saving bulbs work: they don’t waste energy by putting out wavelengths normal humans can’t perceive.



So how do we use this info to defeat the invisibles? First, we’ll lure them (one by one) into our lair, which will be lit using only energy-saving bulbs. They won’t dare turn invisible there because, if they do, they’ll go blind. Then we’ll smack them on the head! Simple!

SINCERELY,
BAH-TARRRR OF PAYH-PAH-BAK, COLONY 773

PS: Another invisible enemy is Mr. India, a chap who gets his powers from his father’s hi-tech gold wristwatch. Our local partner-in-crime Mr. Mogambo tells us that the invisibility effect of this watch doesn’t work in the red spectrum of visible light. I have already ordered special red goggles for all our troops. Mr. India also plays the violin, we are told. For this, we have earplugs.

WIP

Simplifying mathematics



Here's an artist's rendition of Dedi doing family-friendly illusions (because we couldn't stomach the thought of wildlife being beheaded)

GOOD Spelling



Magic has touched human civilisation for centuries, and its influence has been felt through countless myths, legends and folklores. Be it epics like the Ramayana and Mahabharata, fairy tales like Aladdin or Cinderella, or more recent literary rages such as the Harry Potter and Artemis Fowl series – our fascination for magic is unlimited.

The first documented magic show was performed in 2500 BC, when magician Dedi entertained the Egyptian emperor Cheops. The emperor was apparently so impressed that he called for an encore as Dedi first decapitated the head of a goose, then a pelican, and finally an ox – and each time joined the heads back, making them alive and well again! However, it wasn't until the 1820s that modern stage magic came to life with the coming of French magician Jean Eugène Robert-Houdin. Considered

the father of modern magic, Robert-Houdin's words, "the magician is an actor playing the role of a magician," is still an inspiration to all magicians.

However, magicians today perform much more than the 'smoke and mirror' illusions that their predecessors did. They can produce, levitate and vanish coins, cards, or even people right under our watchful eyes! Sometimes trains, buildings and spaceships also disappear with a mere wave of the magic wand! It seems like these illusionists can perform the impossible and make us believe in their 'magical powers'.

But the magician's secret is that he uses the various laws of science to create a unique set of tools and techniques that can fool even the best scientists. The success of this depends on the magician's hush-hush ingredient – misdirection – the art of directing the audience's attention elsewhere, to hide his stealthy moves!

The secrets of magic are, in fact, closely-guarded among its practitioners, and protected by the 'Magician's Code'. This is because the entertainment value lies in the surprise element and the mystery of how a magic trick is performed. As the legendary comic book character Mandrake the Magician (created by Lee Falk) would famously say, "Magicians never tell a secret".

Being at the forefront of scientific and technological innovations, magicians have also made big contributions to society. For example, French magician George Méliès was the first to use special effects in cinema in his film *A Trip to the Moon*, while British magician Jasper Maskelene used his magical skills to hide the Allied military forces (using camouflage) from the German airplanes in World War II!

This column will present different aspects of magic, and teach you magic tricks that you can learn and perform. Magicians call this 'the science of magic'. So go get your magic wands ready!

The Broken Heart

Nakul Shenoy teaches you a magic trick that uses camouflage. It makes the audience believe it's seeing something that it isn't, by making a playing card vanish from the deck and travel invisibly into your pocket!

Materials:

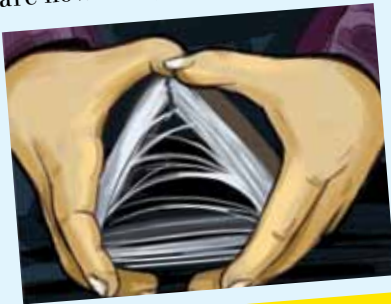
A pack of playing cards

The Trick:

The magician shows three playing cards – two black aces and an ace of diamonds. Putting them face-down on top of the rest of the deck, each card is separately inserted into different parts of the deck. One magical wave of the hand, and the ace of diamond vanishes from the pack of cards and appears in the magician's pocket!

The Secret:

Remove all four aces from the pack. Put the ace of diamonds into your pocket. Now turn the ace of hearts upside down, and along with the two black aces arrange the cards into a fan (see image). You are now ready to perform magic!



Insider's Tip: Remember! The secret of magic is in keeping the secret. And practicing the effect well – really well – before performing it for an audience.

artwork: Yashish Kumar M



Pouroosh or **PC Sorcar Master** comes from a family of very famous magicians. Like his legendary grandfather PC Sorcar, Pouroosh has also attempted some very magical feats – like escaping unharmed from a nailed coffin that was bombarded with explosives! **Aparna Kapur** caught up with the young magician to chat about the science of magic.

Is magic a science? People think of magic as heavenly spells, as something supernatural. On the surface, magic is a performing art, but once you learn the secret, it becomes a science. Everything that is shown on stage, every act that is performed is a trick or gimmick. We use scientific methods to make seemingly wondrous things possible.

How important is light in your illusions? Light is used as a gimmick while vanishing things. It can be used to distract the audience. For instance, if we throw a follow light on someone moving on stage and vary the colours in the light, it creates a diversion and the other parts of the stage will be hidden.

Is the knowledge of science important in magic? While performing on stage, it is vital to have knowledge of science. Suppose my trick is to turn water into a red coloured liquid, and then blow it up in a puff of smoke that will spell out my name, I know the chemical formula to do this. But I have to convince the audience. I then say something like, "I don't like writing my name on paper like everyone else. I like to do this..." and then – whoosh! – my name will appear in the air!



THE PRESTIDIGITATOR!

Archimedes is known today chiefly for jumping out of baths and running around in the nude yelling “Eureka!”. People usually forget that he was also one of history’s great mathematical geniuses, who discovered the principle of buoyancy, fluid dynamics and many other big ideas.

But poor old Archimedes, his reputation wasn’t so hot back in his lifetime either. Archimedes’s contemporaries thought of him as a master war machine builder rather than as a scientist and thinker.

Archimedes first gained this notoreity in 214 B.C.E. when his home, the Sicilian city of Syracuse, was attacked by an armada of Roman ships. The siege was repelled for two whole years with the help of Archimedes’s

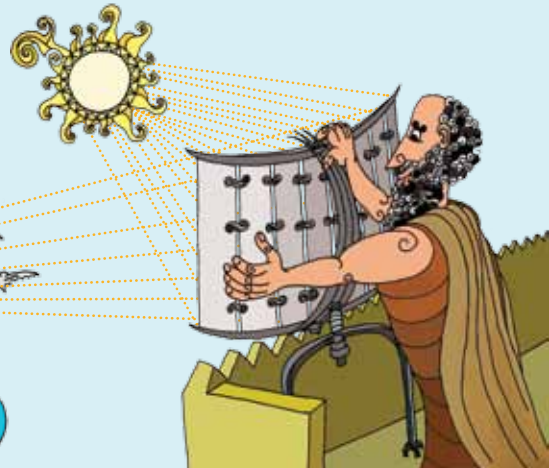
war machines, until the Romans finally overpowered them.

Historians say that one such Archimidean war machine was a parabolic reflector that had the Roman navy scooting for its life (*para-what? go read our explanation below*).

Parabolic reflectors can collect and project energy. So mirrors placed in a parabolic arc can be used to reflect sunlight onto a really narrow area of focus.

It is said that Archimedes used such an array of mirrors as a long distance weapon. With it, he could focus the sun’s rays all the way from the seashore onto the sails of faraway Roman ships. Since sunlight contains heat, the ships would have caught fire within seconds of such an attack!

ARCHIMEDES AND HIS BIG BAD MIRROR OF DEATH



TWO OTHER LEGENDARY WEAPONS TO LOOK UP:

The Archimedes Claw (which was also used during the Syracuse Siege) and Nikola Tesla’s **teleforce death ray** (which, the story goes, can kill an army from 200 miles away).

Many scientists have conducted experiments that have disproved the Archimedes death ray story. What do you think? Can a parabola be used to set ships on fire? Yes? No? Write to brainwave@ack-media.com and tell us why!

WHAT IS A PARABOLIC REFLECTOR?

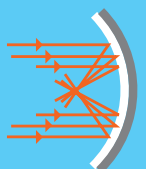
A parabolic reflector is a special kind of concave mirror designed to capture light or other forms of energy, like radio waves, sound and light, and focus it to a single point. You may have seen one already – for instance, the dish antennas that collect TV signals,

solar heaters and even in radar that can detect aircraft and missiles. The parabolic reflector can also be used to produce a parallel beam when the light source is placed at the focal point. You can see this at work in a torch or in your car headlights.

this is how light is reflected from a flat mirror



and this is how light is reflected from a parabolic mirror

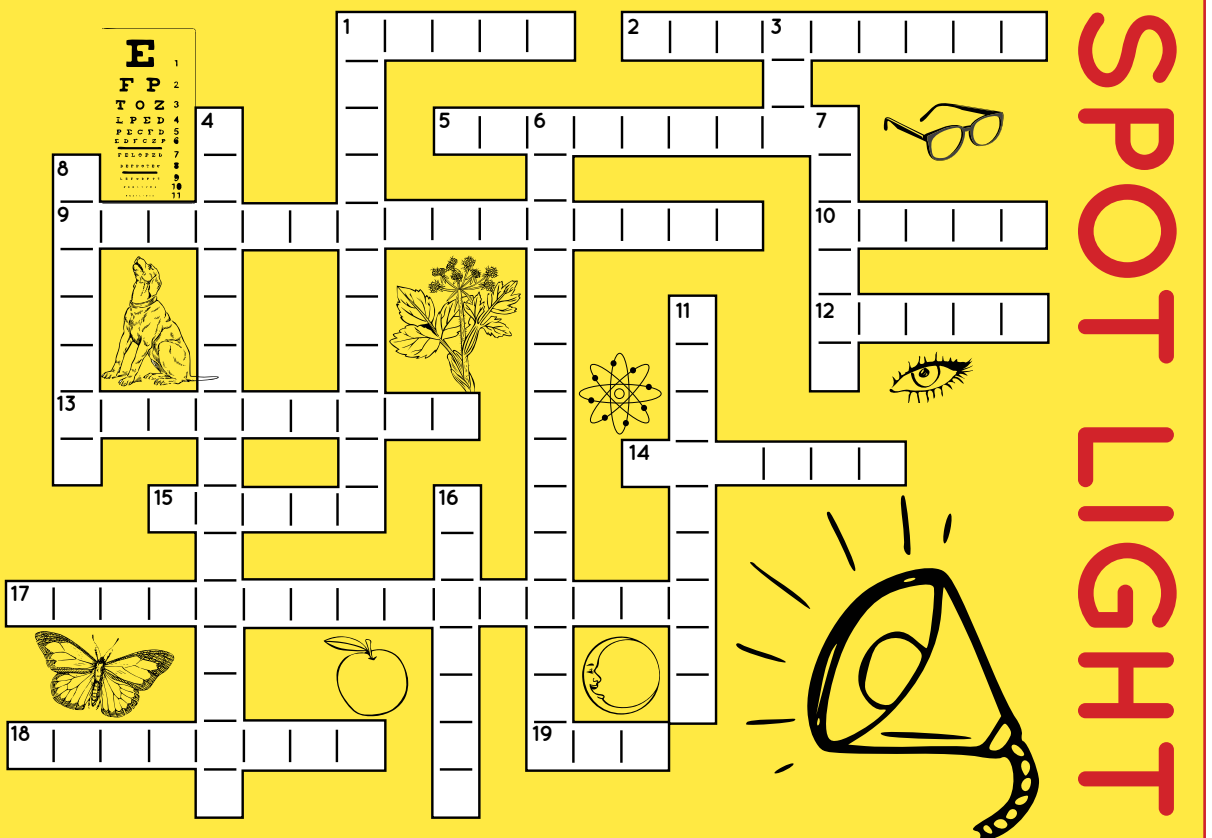


Topical

Content to be readied 15 days prior to publication

ACROSS

- 1 Light travels in the form of _____ (5)
- 2 When light passes through our eye glasses it gets _____ (9)
- 5 The maximum height of a wave is known as its _____ (9)
- 9 A doctor who works on eyes is an _____ (15)
- 10 Light takes about _____ minutes to get from the sun to the earth (5)
- 12 Three cones in human eyes can detect red, blue and _____ (5)
- 13 When light bounces off a smooth metal surface it gets _____ (9)
- 14 A _____ is the basic unit of light given off by an atom (6)
- 15 When light passes from air to water it _____ down (5)
- 17 When a living organism gives off its own light it is known as _____ (15)
- 18 Butterflies have _____ eyes (8)
- 19 The light of the moon actually comes from the _____ (3)



DOWN

- 1 Different colours of light have different _____ (11)
- 3 The colour seen at the top of the arc of a full rainbow is _____ (5)
- 4 When our eyes play tricks on our brains using light it is called an _____ (7,8)
- 6 Plants use light in the process of making food which is called _____ (14)
- 7 Light is a form of _____ (6)
- 8 Dogs are colour-blind but they can see some _____ (7)
- 11 The distance that light travels in a year is a _____ (9)
- 16 An object appears red because it _____ all colours of light except for red (7)

In the winter of 1921, **Thomas Midgely, Jr.** was working as an engineer in a General Motors research lab. One evening, while experimenting with chemical additives, young Midgely found that adding a substance called TEL to petrol made automobile engines less noisy while starting up. TEL, snappily sold as 'Ethyl', turned out to be a big success. The noiseless new Ethyl-fortified petrol did good business for years and was sold all across the globe.

Midgely hadn't properly researched all the effects of his little chemistry experiment, though. 'Ethyl', unfortunately, was only one part of TEL. TEL expands fully to the lethal 'tetra ethyllead'. And lead, as you may already know, is hugely poisonous to the human body. It slowly kills all your major organs and destroys your nervous system. Lead is also thought to be a direct cause of cancer. By putting his anti-knock additive in petrol, Midgely introduced massive quantities of lead to the air we breathe. It has polluted our environment, damaged our health and reduced our lifespans. We continue to live with the ill effects of Midgely's first major discovery.

When GM realised what a horrible new technology their employee Midgely had helped invent, they shifted him out of the gasoline lab and put him in another division – the study of refrigerants. In 1930, Midgely came up with a cool new refrigerant, and he gave it an appropriately cool-sounding name: 'Freon'. Freon worked such wonders that people started using it all over the place – as coolants in refrigerators, in propellants, solvents, spray cans, inhalers and much else. It was Midgely's second big breakthrough.

Freon too had a nasty secret name, an evil tongue-twisting alterego: 'dichloro-difluoromethane'. Dichlorodifluoromethane (say it three times fast!) is a chlorofluorocarbon, or a CFC. And CFCs, scientists realised in time, eat away large chunks of the ozone layer, our main shield in the sky against harmful ultraviolet rays. Ultraviolet rays are today known to cause skin cancer in humans. They also accelerate the greenhouse effect, leading to global warming, weather changes, the melting of the polar ice-caps, rising water levels and a future of natural disasters, drought and disease.

In a single lifetime, Thomas Midgely, Jr. had engineered two of the most destructive chemicals known to man.

Midgely's death at the age of 55 was equally dramatic. Stricken by polio, he invented a complicated system of ropes and pulleys to help nurses lift him off his sick bed. One day, struggling to work his machine, Midgely succeeded in entangling himself in its many ropes. The more he struggled, the tighter grew the ropes, and poor Midgely was strangled to death.



THE LIFE AND DEATH OF THE WORLD'S MOST **DANGEROUS** **SCIENTIST**



Topical

Content to be readied 15 days prior to publication



1.

Benjamin Franklin is credited with the invention of bifocal lenses. But he is famous for yet another discovery that was inspired by his famous 'kite experiment'. What did he discover?

2.

It is something that's put in your cola. It is also pretty toxic and one of the reasons why your mother asks you not to drink fizzies! This molecule's chemical structure had foxed scientists for a long time. Till a German chemist, Friedrich Kekule, had a reverie about a snake seizing its own tail one sleepy afternoon. This 'brainwave' led him to crack the structure of the molecule. Which mystery molecule is this?

3.

In 1873, 15-year-old Chester Greenwood came up with the idea for an invention when he was ice-skating. He went on to manufacture and sell this product in large numbers for sixty years to come. What did he invent?

4.

This Indian scientist was sailing one fine morning to Britain. He felt a bit bored and decided to take a stroll on the deck. Looking at the sea, he was baffled by why the water was blue. He figured that the real reason wasn't so much because of the sky. But because of the way light particles scatter in liquids. Who is this famous scientist? And what 'effect' is he most known for?

5.

The name of this element is derived from the Norse god of thunder. It is radioactive, is a nuclear fuel and India happens to be rich in it. Which future energy source are we talking about?

6.

She's been described as a "quiet, unassuming lady", but she was anything but. This fiery science graduate topped her class, and decided she wanted to become a chemist. But was refused admission by a popular Indian research institute on the absurd grounds that she was a woman! She later went onto become the first Indian woman to get a Ph.D in a science discipline. Who is she?

7.

In 1816, Scottish inventor, Sir David Brewster, came up with an invention that means 'beautiful form watcher' in Greek. Can you guess what he invented? Hint: It produces a variety of colourful images that are always symmetrical.

8.

This theory of evolution says that sons of blacksmiths will inherit strong arm muscles from their fathers. Who proposed this theory and what is it called?

Look for the answers on page 41!

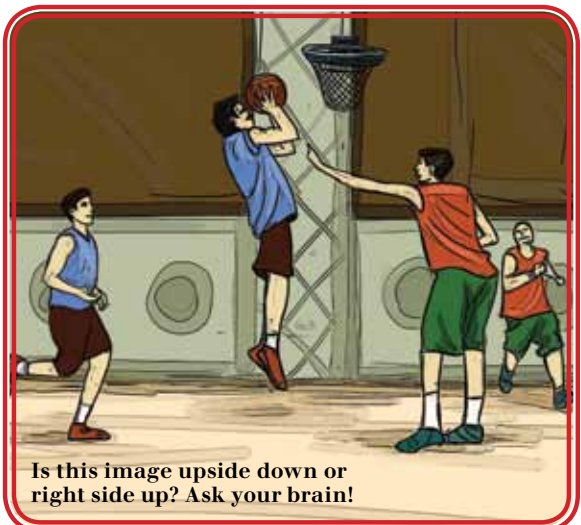
THROUGH THE LOOKING GLASS



Which part of the human body is the second most complex organ after the human brain, consists of two million working parts and contributes to 85% of all information we receive through our senses? The human eye! While most of us take the process of sight for granted, there is an amazingly sophisticated mechanism that lets us 'see' the world around us. Read on to discover some interesting and bizarre facts about the ocular organ!

It's speculated that when a baby is just born, it sees objects upside down for the first few days. But soon after, the baby's brain learns to flip the image, and it begins to see the world, straight up!

off it and enters our eye), two inverted images form on each of our retinas, simultaneously. So why do we see a single image and not two separate ones? And more surprisingly, why don't we see the object upside down? This is due to the handiwork of the ingenious brain which combines the two distinct images on each retina into one and then flips the inverted images right side-up. An innovative study demonstrated how this mechanism works. Participants were asked to wear glasses with inverting lenses. These lenses flipped the image once (upside down), then the eye flipped it again (right side-up), and the brain did another final flip, making the image upside down. So at first, everything appeared the wrong way up to participants. But, remarkably, within a few days, the brain stopped flipping the image and the subjects were able to see things normally, and un-inverted. In Part II of this study, participants were then asked to take off their inverting glasses. And within a day, down images started straightening the upside down images falling on the eye once again.



Is this image upside down or right side up? Ask your brain!

Visual processing is a complicated and fascinating process. Let's see how it works. Human beings possess a pair of retinas, one in each of our eyes. The instant we see an object (which happens when light bounces

THE UPSIDE DOWN OF SEEING

HOW POWERFUL ARE YOUR EYES?

After the human brain, our eyes are the most complex organs. They use 65% of our brainpower. The human eye can process an approximate 36,000 bits of information per hour. It can also bring us up to 24 million images during our lifetime.

Under the right conditions, our eyes can detect the light of a candle placed 20km away. Our eyes adjust to new images in a matter of milliseconds in order to keep our balance whenever we move our heads.

CURING BLINDNESS

Light is not perceived by all of us in the same way. Unfortunately, some children inherit blindness. This happens when some defective genes get transferred from parent to child. However, the latest developments in gene therapy hold great promise for curing or preventing inherited blindness. Sometime in the not-so-distant future, this technique will allow doctors to treat inherited eye disorders by inserting a gene into the child's cells instead of using drugs or surgery. So, an 'abnormal' disease-causing gene is replaced by a 'normal' one. Just think, how extraordinary it would be if we could use this therapy to cure blindness and upgrade human vision by borrowing genes from other animals!

STRANGE SIGHTS

- The burrow-hiding prairie dogs have eyes high on their heads so that they can look at the world above their burrows without having to step out fully.
- A chameleon has eyes that move independently, allowing it to see in two different directions at the same time.
- A falcon has a superior retina that enables it to spot a 10cm object at a distance of 1 km! It can also see sharp images even when it dives at very high speeds.
- An owl has a wider pupil and increased retinal surface to collect more light. This allows it to see in the dark. It can spot a mouse scuttling 150 feet away in light as dim as candlelight.
- Some deep sea fish have an astounding 25,000,000 receptors in their retinas which enable them to detect very dim light in the ocean's depths. Human eyes have about 2,00,000 receptors per mm² in their retinas.
- A speedy duck hawk has a crystal-clear third lid which helps it to see under water, as it takes a 180-mile-an-hour power dive into the water.
- Some fish have each eye divided by flaps so that one portion of the eye opens into the air and one into the water. This lets them see simultaneously in air and water!
- Most bees and butterflies can see in the ultraviolet spectrum. So they can see plenty more colours than we can.



SUPEREYE SPY

Wouldn't it be cool to round up the best eye features from various animals and create a human 'SUPEREYE'?! Imagine mixing superpowerful night vision from owls, ultraviolet sight from butterflies, and special infrared snake vision! There's more to pick and choose from. The eyes of dragonflies, jellyfish, scallops, and Cuban shovel nose toads are pretty unusual too. See if you can find out what their special features are, and draw out your own all-seeing human eye.

THE MASH MONSTER

text: Rajita Gadagkar

This super strange, incredibly weird looking creature pictured here was spotted scuttling around a rubber plantation in the south Indian city of Calicut last week. Initially, curious locals in the area tried to capture the animal, causing it to scamper up a coconut tree in wild panic. While early reports believed the animal to be some kind of amphibious monster, later findings by zoologists, who have arrived on the scene in bus-loads, conclude that it is nothing short of an evolutionary marvel! Closer observation has revealed that the 'Mash Monster' (as it has been affectionately nicknamed) is a combo of reptile, bird, insect and land animal. Can you take a very close look and name all of the five different animals that have gone into the making of this remarkable new species?

You can check out the answer on page 38 — but we urge you not to give up so easily!

artwork: Vinayak Varma

The last Pyrenean ibex was spotted in 2000, after which these mountain goats have been declared extinct. Unless we do something about it, house sparrows may suffer the same sad end.

Extinct

BACK TO THE FUTURE

Once upon a not-so-long time ago a fawn-coloured species of wild mountain goat grazed in the Pyrenees mountains (a range at the edge of France and Spain). This graceful creature with perfectly curved horns, called the Pyrenean Ibex, minded its own business as it foraged for herbs in the Basque countryside – until it caught the eye of a bored European gentry whose favourite pastime was hunting. Under human attack, the ibex, also known as ‘bucardo’, disappeared in large numbers.

On Jan 6, 2000, the last remaining bucardo, Celia, died in a mysterious accident, making this sub-species fully extinct. But this wasn't the real end. The Pyrenean Ibex became ‘un-extinct’



artwork: Vinayak Varna

for a short period of seven minutes in January 2000. Spanish scientists used the DNA from preserved skin samples of Celia and injected this material into the eggs of a domestic goat. The result was the clone of a living female Pyrenean Ibex!

Unfortunately, the miracle lasted for just a few minutes, as the newborn kid died shortly after her birth.

This cloning experiment, however, has thrown open a world of possibilities. It is hoped that several extinct and about-to-get extinct species can be brought back to life from their frozen tissue, sometime in the future.

Who knows – this technology may also allow us to reproduce long-gone creatures like dodos, woolly mammoths and even dinosaurs!

Threatened

COUNTING SPARROWS

Do you remember the little brown birds that chirped joyfully and hopped all around – the house sparrows? Then you're lucky, because many of your younger friends or siblings may have trouble recognising them, because their numbers in India have severely reduced. The story of the house sparrow is an ironic one. It originated in the Middle East, but man took this species of bird to all corners of the world. And being such an adaptable little bird, it flourished everywhere it went. But then the house sparrows got a bit too comfortable. They began to multiply at a fast rate. They ate seeds from the fields, made nests in buildings and homes, became a threat to other birds and a ‘pest’ to people. The same sparrow lovers who doted on them earlier now destroyed their nests and killed them. Worse, signals from mobile towers and microwave radiation

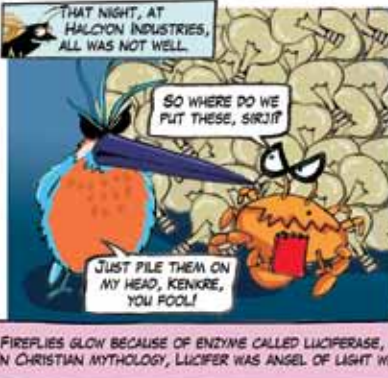
photo: Lip Kee



caused new and dangerous diseases for this species of sparrows.

Today, house sparrows in India are nearing extinction, and fast. Unless we make a change. Flip to our ‘Try Out’ section on page 39 to discover how you can do your bit to bring the cute little house sparrow back to your neighbourhood.





MASTER HU FLU LO SAY: FIREFLIES GLOW BECAUSE OF ENZYME CALLED LUCIFERASE, WHICH DERIVES NAME FROM 'LUCIFER', LATIN FOR 'LIGHT-BRINGER'. IN CHRISTIAN MYTHOLOGY, LUCIFER WAS ANGEL OF LIGHT WHO FELL FROM GRACE AND BECAME SATAN.

END



The tiger

or *Panthera tigris* is one of the most elusive and magnificent animals in the wild. It is nicknamed 'the big cat' as it happens to be the biggest member of the cat family, also called the Felidae family. These striped carnivores can eat up to 60 pounds of meat in a go and sleep for 18 hours straight. The only animal that rivals the tiger in overall strength and deadliness is the lion. Sadly, tigers are an endangered species today. Their numbers have dropped dramatically because of poaching and destruction of their habitat. At the start of the 20th century, there were some 100,000 tigers in the wild and this number has fallen to just about 3,200, currently. Several subspecies of the tiger are on the verge of extinction, and these include the Indochinese tiger, the Malayan tiger and the Sumatran tiger. Luckily for us, the Indian or Bengal tigers are still the the most abundant ones, and make up a large part of the current tiger population.

The photograph, of a tigress in the wild, was shot at Kanha National Park by Nithila Baskaran.

Jim Corbett: The Hunter of Kumaon



This is the story of an avid sport-hunter who became a great wildlife conservationist and founded India's first national park.

Edward James 'Jim' Corbett was born in Nainital in 1875, where his father was the postmaster. In the 1860s, when Jim was growing up, wildlife was abundant. He spent his childhood exploring the jungles of Kumaon, now located in the state of Uttarakhand. Jim was all of ten years old when he began hunting.

He grew up to be a big, strapping hunter who tracked and shot many man-eating tigers and leopards. He soon became a respected wildlife expert, often invited to guide hunting expeditions. During one such trip, the group he was with chanced on a lake swarming with water birds. The hunters opened fire and, in a matter of minutes, the lake had become a field of dead birds. This image shocked Jim into giving up hunting just for sport.

At the age of 45, Jim bought his first camera. Soon he began shooting the jungles and its inhabitants once again, but this time from behind the lens. As time passed, Jim realised that there was a grave need to protect tigers and their habitats. He then began a career as a conservationist and wrote several books on tigers. He also helped set up the 'Hailey National Park' in Uttarakhand. This park was later renamed 'Jim Corbett National Park' in his honour.

THE YOUNG CONSERVATIONIST

Madhav Subrahmanyam is a 13-year-old tiger conservationist. He started 'Kids for Tigers' in Mumbai when he was just six years old. Since then, he has raised around Rs 6 lakh for the welfare of tigers. Two years ago, Madhav was named as one of the 50 people who can save the planet by *The Guardian*, a British newspaper.

Madhav spotted his first tiger when he was two years old. "It was a tigress, actually" he recalls. "She was walking behind our jeep, while her cubs were in the bushes. The moon rays were visible behind her," he recalls. Since then, Madhav had been fascinated with tigers.

When he found out that there were only 3,000 odd tigers left in the wild, he felt pretty disheartened. He then hit upon the bright idea of raising money for tigers by doing odd jobs for people around his neighbourhood. "I started polishing shoes and arranging flowers" he says. "I got a couple of lucky breaks. Once, I cleaned the shoes of some of my mother's friends and they didn't have any rupees. So they gave me \$5!"

Madhav didn't stop at that. He began drawing tigers and other jungle creatures. His drawings have been turned into mugs and quilts which are available at the store Good Earth. Proceeds from their sales go to the 'Madhav Tiger Conservation Fund'.

Madhav now lives in Indonesia, from where he continues his tiger crusade.

Some of Madhav's cool fundraiser merchandise



EARN YOUR STRIPES

We recently spoke with **Belinda Wright**, tiger conservationist and the Founder and Executive Director of the Wildlife Protection Society of India, to quiz her about the dwindling number of tigers in India. Here is what she said:

Is there any hope of reviving the tiger population?

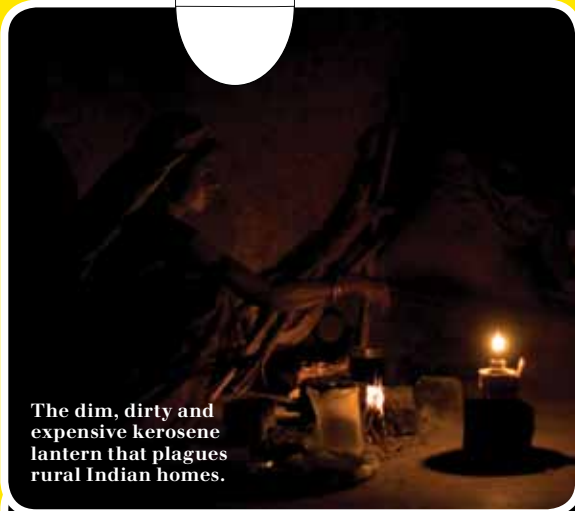
There is hope because the Indian government is now investing huge sums of money to curb the decline of wild tigers and we now have a very active Minister of the Environment and Forests, Jairam Ramesh. There is also hope because we have a number of extremely concerned conservationists and scientists. But real change will happen when enough people in India start caring about securing a future for wild tigers. It is not difficult to save the tiger. If they are given enough space, food and water, they breed well and multiply quickly.

How can children contribute to this revival?

Children can raise funds and support wildlife initiatives, and stay informed of current developments in the battle to save the tiger. They can work to spread the message in their schools, homes and colonies. They can volunteer with wildlife organisations, start campaigns or undertake simple and fun fund-raising activities such as conducting tiger walks.

AD

A light bulb moment!



The dim, dirty and expensive kerosene lantern that plagues rural Indian homes.



A safe, affordable, long-lasting solar home light.

Photos of Sun King™ solar lamp courtesy of Greenlight Planet

to a rough estimate, there are still about 480 million homes without grid electricity. “People use kerosene lamps, which are not only expensive and inefficient, but harmful to health too,” says Anish Thakkar, co-founder and Global Marketing Manager of Greenlight Planet. This United States-based company has recently launched a solar home light, ‘Sun King’, which emits up to 16 hours of light after charging in the sun for a day. It is now taking this product to light up villages in the country.

There are several other companies like InnovLite, D.light and Selco, that are also addressing lighting needs using this eco-friendly technology. Describing D.light’s inventions, Mandeep Singh, the Chief Operating Officer (India), says, “The D.light Kiran, developed completely in the villages, is called the students’ light. D.light Nova gives up to 20 hours of back-up power if switched on low mode. In villages, people burn a small kerosene lamp called ‘dibbi’, while sleeping. This creates indoor air combustion which is very harmful. So, we decided to offer a night lamp too.”

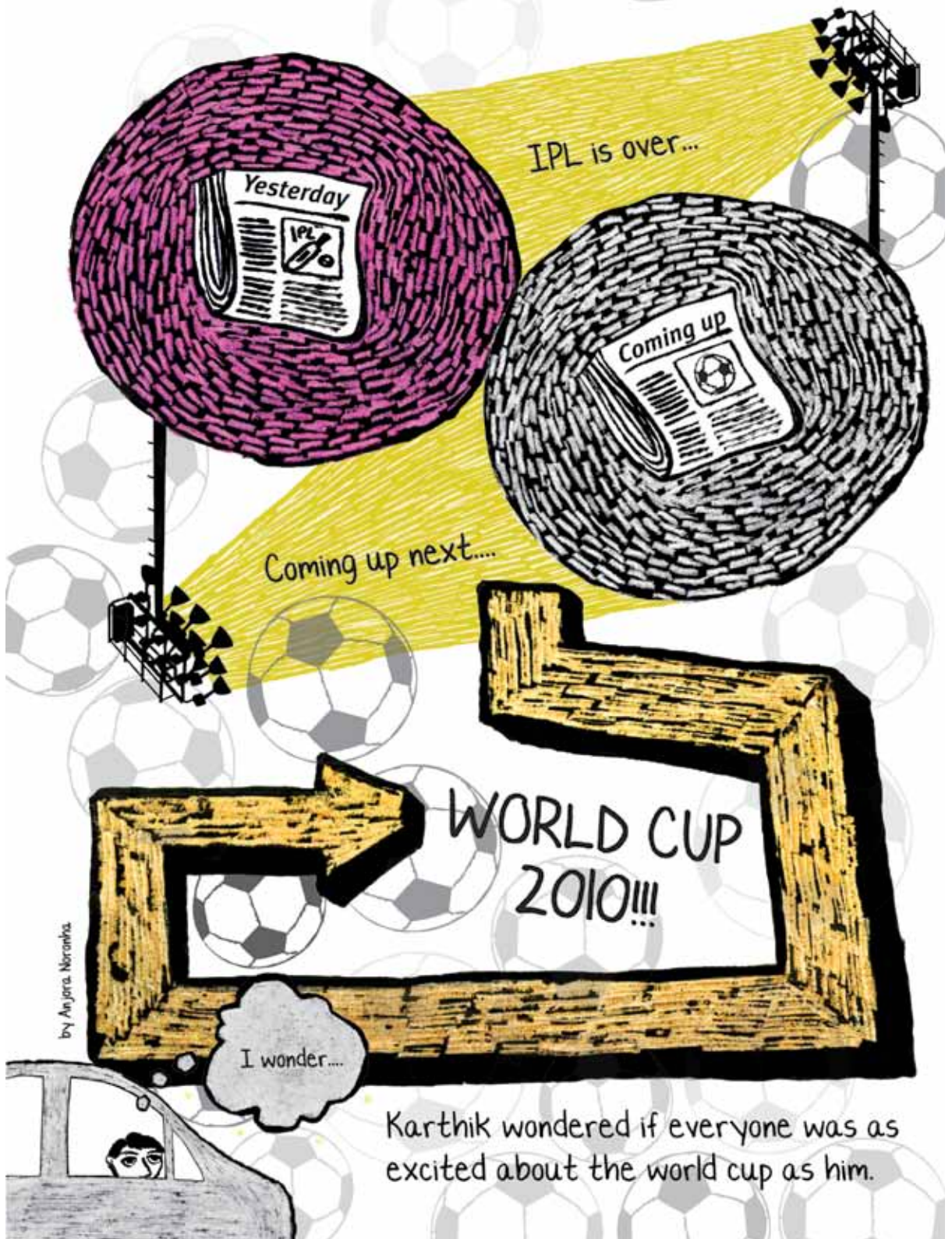
However, remote places are not likely to accept unknown technology readily, which has been a stumbling block in the distribution of LEDs. To overcome this, a Bangalore-based company, Selco, has adopted a hands-on approach. Managing Director, Dr. Harish Hande, says, “We have a doorstep service. We go and install it in each and every household. People do accept it once they realise the value of it.”

The value of LED technology lies in its simplicity, convenience and energy efficiency. “What is special about our products is that they are extremely easy to use. Plus, they provide white, bright light as opposed to the yellow dingy light. So people obviously find that much better,” says Mandeep.

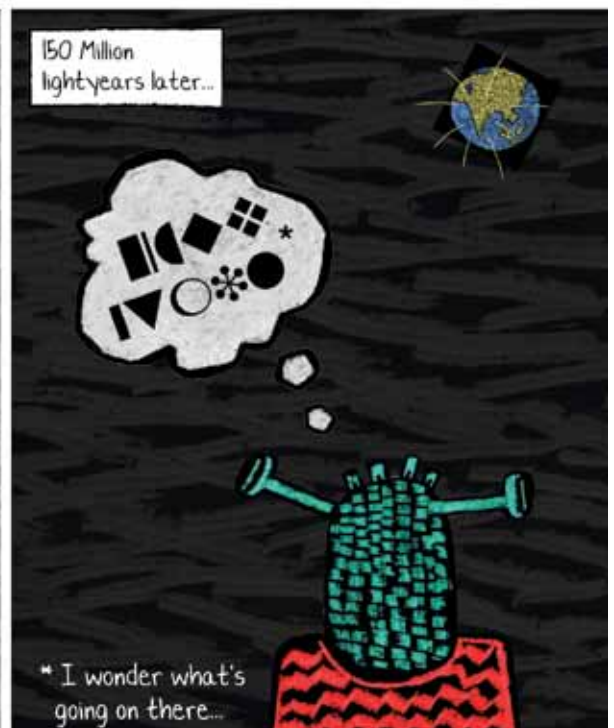
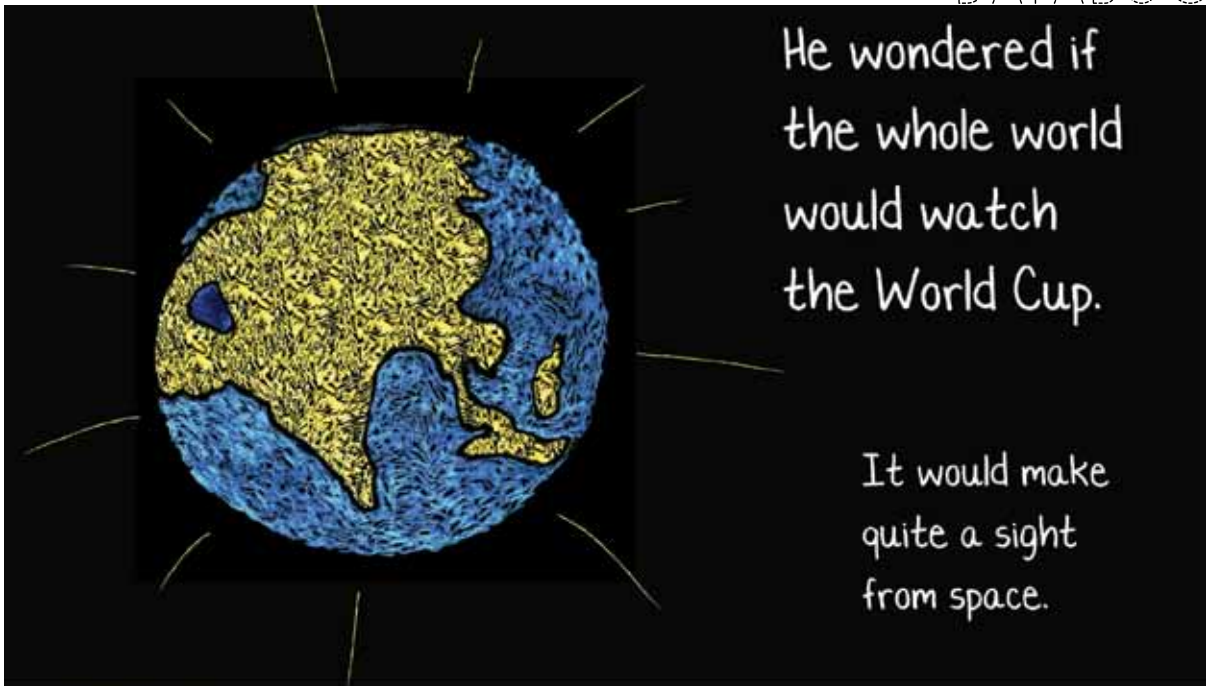
Inventions such as solar-powered LEDs are empowering rural households with bright, white light. Now that’s what powerful technology is all about!

Every now and then, there come along inventions that light up the lives of people, quite literally. One such bright idea is the solar-powered LED or ‘Light Emitting Diode’. These sun-charged LED bulbs, lamps and lanterns harness the sun’s energy to give out light that is both affordable and energy-efficient. What’s more, a few visionary organisations are taking this innovative technology to homes in rural India, where lighting solutions are sorely needed.

Even today, huge parts of India are plunged in darkness everyday. According



Karthik wondered if everyone was as excited about the world cup as him.



Somewhere, a school bus stops. A little girl leaps out, dragging her green canvas bag down the steps. Bump bump BRAAAAAANG! It flies open and her things are all over the road. Pencils, books, a rubber, a sharpener, and a yellow hair band she's not allowed to wear because the school colours are blue and dark blue.

As she kneels to pick the things up, the children in the bus snigger. "Spaz!" they shout, "Goobe!" A ray of light strikes her eye, and she looks straight at it, willing it to carry her far far away. And because the ray of light is actually, just this once, being ridden by a very nice person named Minsk, it pulls her on, and she is off.

The girl doesn't scream. This is not because she doesn't want to. But in the huge giant emptiness of space, she might well have screamed, but the sound has been left far far behind by her ray.

The person named Minsk is a fuzzy blur holding her on, making sure she doesn't fall up or down or sideways, or deep into day after tomorrow. Terrible things can happen when one speeds across space on a ray of light.

After a while, the girl is hungry. The stars no longer look quite so bright and sparkly, and even the deep black of space seems a

little greyer. Hunger, she knows, has this effect on carbon-based people who are furry and have short attention spans such as herself. Luckily for her, Minsk has been around a lot, and notices that his passenger is beginning to wilt.

He grabs her by the scruff of the neck – he'd read somewhere that carbon-based people with lots of fur and short attention spans carried their offspring around by the scruff of the neck. This is not untrue – many carbon-based furry people like wolves and cheetahs do do this exact thing. Humans, however, have bad scruffs on their necks, and tend not to like being carried by them, anyway.

The girl closed her eyes and made a strangled noise. When she opened them, she was on what could only be called ground. It was the ground of a small asteroid

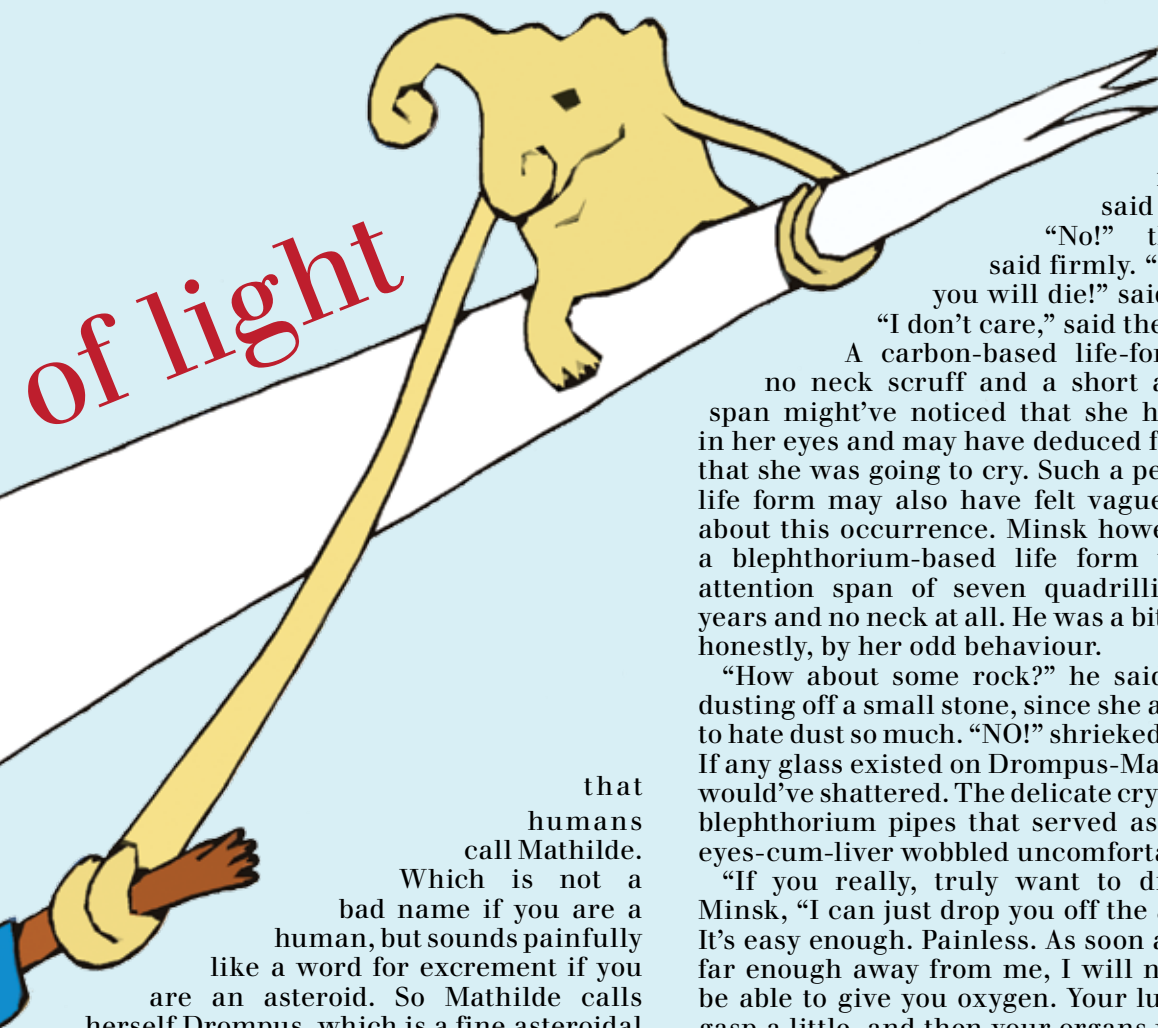
The girl who rode a ray



artwork: Vinayak Parmar

It is impossible to travel faster than the speed of *LIGHT*, and certainly not desirable, as one's hat keeps blowing off.

- Woody Allen



good
for you!"

said Minsk.

"No!" the girl
said firmly. "But then
you will die!" said Minsk.

"I don't care," said the girl.

A carbon-based life-form with
no neck scruff and a short attention
span might've noticed that she had tears
in her eyes and may have deduced from this
that she was going to cry. Such a perceptive
life form may also have felt vaguely sorry
about this occurrence. Minsk however was
a blephthorium-based life form with an
attention span of seven quadrillion light
years and no neck at all. He was a bit baffled,
honestly, by her odd behaviour.

"How about some rock?" he said kindly,
dusting off a small stone, since she appeared
to hate dust so much. "NO!" shrieked the girl.
If any glass existed on Drompus-Mathilde, it
would've shattered. The delicate crystallised
blephthorium pipes that served as Minsk's
eyes-cum-liver wobbled uncomfortably.

"If you really, truly want to die," said
Minsk, "I can just drop you off the asteroid.
It's easy enough. Painless. As soon as you're
far enough away from me, I will no longer
be able to give you oxygen. Your lungs will
gasp a little, and then your organs will stop
functioning and you will die."

The girl hung her head. "I want to go
home," she said.

Minsk whistled, and the light ray came up
to them, obedient. He grabbed the girl by the
scruff of her neck, and the sun flashed by.

A girl kneels on the ground next to a
green canvas bag, amongst some pencils,
some books, a rubber, a sharpener, and a
yellow hair band. She appears to be too busy
breathing to notice that several children are
sticking their heads out of the bus above her
and laughing.

that

humans
call Mathilde.

Which is not a
bad name if you are a
human, but sounds painfully
like a word for excrement if you
are an asteroid. So Mathilde calls
herself Drompus, which is a fine asteroidal
name that means 'one who is passionate and
rocky'.

The girl and Minsk stood on Drompus-
Mathilde and looked around. Light shot
past them. Minsk handed the girl some
dust. "Eat," he said kindly. "That's mud!"
said the girl, annoyed. "It is. Fine carbon
to restore your tissues!" Minsk said, "Plus
some calcium and some iron. My chemical
calculations indicate that this will make
your - forgive me - very meagre neck scruff
grow lustrous and happy."

"I don't eat mud," said the girl. "But it's

THE MONSTER UNMASHED

And this is what that busload of zoologists in Calicut (SEE PAGE 26) found when they finally caught up with the **Mash Monster**...



Two legs and a torso from a KOMODO DRAGON:

The Komodo dragon is the largest species of lizard, found in some Indonesian Islands. In addition to its set of normal eyes, the komodo dragon has a third eye on the top of its head! This special eye can sense the angle of the sun's rays and is believed to help the Komodo dragon tell the time of the year.



The head of a TAPIR:

The tapir is a herbivore, quite similar in appearance to a pig. It is found in the forests of South America, Central America and South-East Asia. Baby tapirs have striped and spotted coats to help them camouflage.



Two legs and a long snout from a GHARIAL:

The gharial is a crocodile-like reptile which was once found in great abundance in all major river systems in and around India. But it is now a critically endangered species. The long, narrow snout, that is typical of the gharial, appears to have evolved over time to help it catch small fish underwater. Watch Romulus Whitaker's inspiring TED talk on the challenges of reptile conservation in India at this link: <http://www.youtube.com/watch?v=vW99KFD-Bk8>



And a FIREFLY's glowing tail:

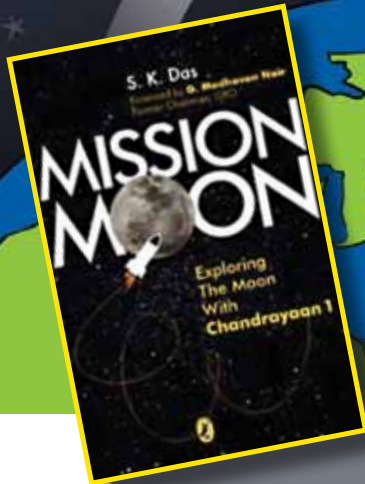
The firefly is commonly found in marshes and forests. These glow-in-the-dark insects emit a chemically-produced light to attract mates and turn off their prey. Light is produced by two chemicals in the firefly's abdomen, 'luciferin' and 'luciferase'.



A TURKEY's feathers:

Known as 'America's favourite bird', the turkey is the largest bird found in the forests of North America. In the 1900s, the 'turkey trot' was a wildly popular dance in which people bobbed their heads and strutted about in circles just like turkeys!

OVER THE MOON AND BACK



Mission Moon: Exploring the Moon with Chandrayaan 1

Author: SK Das

Price: Rs 175

Publisher: Puffin

Mission Moon chronicles the story of Chandrayaan 1, India's first unmanned mission to the moon, which was launched in October 2008.

"The moon is not like our planet Earth", writes SK Das in his book. "People have never lived there and yet they have dreamt about it for centuries".

He narrates the story of one such person, Madhavan Nair, whose grandmother would promise to get him the moon if he would eat everything that was on his plate. Nair grew up with the dream intact and in 2003, and became the chief of the Indian Space Research Organisation (ISRO). The 'Moonman' later became one of the key people instrumental in launching the Chandrayaan.

For those bitten by the astronomy bug, there's plenty to discover in this book. Hidden among its pages are facts about the moon, and the myths and legends that surround it. The book also explains the science of moon exploration and what it takes to launch a mission to this celestial body.

Das manages to recreate the fascinating journey of Chandrayaan 1, peppering it with facts and anecdotes. However, the book feels a bit text book-like, despite the illustrations and photographs. After all, we have already seen books like *George's Secret Key to the Universe* by Lucy and Stephen Hawking, which manages to integrate facts about outer space with a fun narrative about a super computer and two best friends.

Yet, *Mission Moon* is a great addition to the school or home library. Go on, get a bit moony!

Neighbourhood Sparrow Watch

The conservation organisation **Nature Forever Society** offers the rare opportunity to adopt very affordable nest boxes and feeders, especially made for sparrows. You can give house sparrows a cosy home by entering your name and address on the Nature Forever website (see below). And a nest box made of recycled pine heartwood will be delivered at your doorstep. Put it up and you have your very own sparrow reserve! Remember to make sure your nest box is not painted with unsafe paints. Also, keep it out of the reach of cats. If there are no sparrows around your home, you could adopt nest boxes made for a number of other birds, including mynahs, Indian robins, rose-ringed parakeets and barn owls.

To adopt a nest box, all you have to do is call **Mohammed E Dilawar** on 09420001820. For more information, log onto www.natureforever.org or www.worldhousesparrowday.org

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Answers to various puzzles

AD